

EXPRESS MAIL LABEL NO. EL863783717US

CLAIMS

1. A method for compressing image data, comprising the steps of:
identifying a plurality of image tiles within a composite image data set,
5 wherein a mask data value and a valid data value are associated with each of
one or more pixels within the composite image data set and wherein the image
tiles are identified through analysis of a plurality of mask data values and valid
data values;
characterizing an image data group within at least one image tile within
10 the plurality of image tiles as one of linework image data or continuous tone
image data; and
encoding the image data group for at least the one image tile, wherein the
image data group is encoded by an encoding algorithm selected based upon the
characterization of the image data group.
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2. The method according to claim 1, further comprising the step of encoding
the composite image data set by an encoding algorithm with run length encoding
and runend encoding
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3. The method according to claim 1, wherein the step of characterizing an
image data group includes characterizing an image data group as linework
image data if an aggregation of valid data values associated with pixels within
the image data group is equal to true and an aggregation of mask data values
associated with pixels within the image data group is equal to false.
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4. The method according to claim 1, wherein the step of characterizing an
image data group includes characterizing an image data group as continuous
tone image data if an aggregation of mask data values is equal to true.

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5. The method according to claim 1, wherein the step of encoding includes encoding by an algorithm selected to be a JPEG encoding algorithm when the image data group is characterized as continuous tone data.

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6. The method according to claim 1, wherein the step of characterizing an image data group includes characterizing an image data group as continuous tone data and wherein the image data group comprises a plurality of meta-data indicators that each indicate the presence of data within each pixel of the composite image data and wherein the step of encoding further comprises the sub-steps of:

determining if the image data group contains blank image data through examination of the plurality of meta-data indicators; and

returning, in response to a determination of a blank image by the step of determining, an encoded image data set representing a blank image wherein the encoded image data set is generated by assembling a combination of pre-stored compressed data output codewords.

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20. 7. The method according to claim 1, wherein the step of encoding includes encoding by an LZW encoding algorithm if the image data group is characterized as linework data.

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8. The method according to claim 7, further comprising the step of:
determining whether the image data group consists of two-tone image
data and wherein the step of encoding, in response to a determination that the
image data group consists of two-tone image data, produces an LZW formatted
output by using arrays containing previously stored codewords corresponding to
codewords representing runs of data values within the image data group that are
equal to one of 0x00 and 0xff.
- 10 9. The method according to claim 7, wherein the step of encoding further
comprises the sub-steps of:
analyzing a sequence of data within the image data group to identify a
plurality of data patterns within the sequence of data;
outputting a codeword that represents each data pattern within the
plurality of data patterns;
storing, in at least one separate data structure, a plurality of codewords
wherein each codeword within the plurality of codewords is associated with a
different data pattern within the plurality of data patterns, and wherein the data
pattern that is associated with each codeword stored in the at least one separate
data structure ends with a unique pre-defined data value; and
retrieving one of the plurality of codewords from the separate data
structure upon a subsequent occurrence of a data pattern that ends with the pre-
defined data value
- 15 20 25 10. The method according to claim 9, wherein the step of storing includes
storing codewords that are associated with data patterns that end with the
unique pre-defined data value equal to 0x00.

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11. The method according to claim 1, wherein the step of identifying a plurality of image tiles further comprises the sub-steps of:

 accumulating a plurality of scan lines that are contained within the composite image data;

5 analyzing a division buffer meta-data set, wherein the division buffer meta-data set comprises an accumulation of a mask data value and an accumulation of valid data value that are associated with each column of the plurality of scan lines;

10 determining a tile division definition, wherein the tile division definition identifies separate tiles within the plurality of scan lines by identifying at least one run within the accumulation of valid data values, wherein each of the at least one run contain a contiguous set of the accumulation of valid data values that have the same value.

15 12. The method according to claim 11, wherein the step of accumulating is performed by performing a pixel-by-pixel logical-OR for all pixels in corresponding columns within the plurality of scan lines.

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13. An image data compression system, comprising:

an image tile identifier for identifying a plurality of image tiles within a composite image data set, wherein a mask data value and a valid data value are associated with each of one or more pixels within the composite image data set and wherein the image tiles are identified through analysis of a plurality of mask data values and a plurality of valid data values;

5 a tile data characterizer for characterizing an image data group within at least one image tile within the plurality of image tiles as one of linework image data or continuous tone image data; and

10 a tile data encoder for encoding the image data group for at least the one image tile, wherein the composite image data set is encoded by an encoding algorithm selected based upon the characterization of the image data group.

15 14. The system according to claim 13, further comprising a composite image data set encoder for encoding the composite image data set by an encoding algorithm with run length encoding or runend encoding

20 15. The system according to claim 13, wherein the tile data characterizer operates by characterizing an image data group as linework image data if an aggregation of valid data values associated with pixels within the image data group is equal to true and an aggregation of mask data values associated with pixels within the image data group is equal to false.

25 16. The system according to claim 13, wherein the tile data characterizer operates by characterizing an image data group as continuous tone image data if an aggregation of mask data values is equal to true.

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17. The system according to claim 13, wherein the tile data encoder selects a JPEG encoding algorithm when the image data group is characterized as continuous tone data.

5 18. The system according to claim 13, wherein the data characterizer has characterized the image data group as continuous tone data and wherein the image data group comprises a plurality of meta-data indicators that each indicate the presence of data within each pixel of the composite image data and wherein the tile data encoder further comprises:

10 a blank image detector, wherein the blank image detector determines if the image data group contains blank image data through examination of the plurality of meta-data indicators;

15 a blank image data producer for producing, in response to a determination of a blank image by the blank image detector, an encoded image data set representing a blank image whereby the encoded image data set is generated by assembling a combination of pre-stored compressed data output codewords.

20 19. The system according to claim 13, wherein the tile data encoder selects an LZW encoding algorithm if the image data group is characterized as linework data.

25 20. The system according to claim 19, further comprising:

 a two-tone image detector for determining whether the image data group consists of two-tone image data and wherein the tile image encoder, in response to a determination that the image data group consists of two-tone image data, produces an LZW formatted output by using arrays containing previously stored codewords corresponding to codewords representing runs of data values within the image data group that are equal to one of 0x00 and 0xff.

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21. The system according to claim 19, wherein the tile data encoder further comprises:

5 a data sequence analyzer for analyzing a sequence of data within the image data group to identify a plurality of data patterns within the sequence of data;

10 a codeword output generator for outputting a codeword that represents each data pattern within the plurality of data patterns;

15 a codeword data storage for storing, in at least one separate data structure, a plurality of codewords wherein each codeword within the plurality of codewords is associated with a different data pattern within the plurality of data patterns, and wherein the data pattern that is associated with each codeword stored in the at least one separate data structure ends with a unique pre-defined data value; and

20 a codeword data producer for retrieving one of the plurality of codewords from the separate data structure upon a subsequent occurrence of a data pattern that ends with the pre-defined data value

22. The system according to claim 21, wherein the codeword data storage stores codewords associated with data patterns that end with the unique pre-defined data equal to 0x00.

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23. The system according to claim 13, wherein the image tile identifier performs the following functions:

5 accumulation, into a division buffer, a plurality of scan lines that are contained within the composite image data;

analysis of a division buffer meta-data set, wherein the division buffer meta-data set comprises an accumulation of a mask data value and an accumulation of valid data value that are associated with each column of the plurality of scan lines within the division buffer;

10 determination of a tile division definition, wherein the tile division definition identifies separate tiles of the scan lines accumulated in the division buffer by identifying at least one run within the accumulation of valid data values, wherein each of the at least one run contain a contiguous set of the accumulation of valid data values that have the same value.

15 24. The system according to claim 23, wherein the image tile identifier accumulates the plurality of scan lines by performing a pixel-by-pixel logical-OR for all pixels in corresponding columns within the plurality of scan lines.

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25. A computer readable medium including computer instructions for compressing image data, the computer instructions comprising instructions for:

5 identifying a plurality of image tiles within a composite image data set, wherein a mask data value and a valid data value are associated with each of one or more pixels within the composite image data set and wherein the image tiles are identified through analysis of a plurality of mask data values and valid data values;

10 characterizing an image data group within at least one image tile within the plurality of image tiles as one of linework image data continuous tone image data; and

15 encoding the image data group for at least one of the at least one image tile, wherein the composite image data set is encoded by an encoding algorithm selected based upon the characterization of the image data group.

20 26. The computer readable medium according to claim 25, wherein the instructions for encoding includes instructions for encoding by an encoding algorithm with run length encoding and runend encoding

25 27. The method according to claim 25, wherein the instructions for characterization comprise instructions for characterizing the image data group as linework image data if an aggregation of valid data values associated with pixels within the image data group is equal to true and an aggregation of mask data values associated with pixels within the image data group is equal to false.

25 28. The computer readable medium according to claim 25, wherein the instructions for characterizing an image data group includes instructions for characterizing an image data group as continuous tone image data if an aggregation of mask data values is equal to true.

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29. The computer readable medium according to claim 25, wherein the
instructions for encoding include instructions for encoding by an algorithm
selected to be a JPEG encoding algorithm when the image data group is
characterized as continuous tone data.
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30. The computer readable medium according to claim 25, wherein the
instructions for characterizing an image data group include instructions for
characterizing an image data group as continuous tone data and wherein the
image data group comprises a plurality of meta-data indicators that each indicate
the presence of data within each pixel of the composite image data set and
wherein the instructions for encoding further comprise instructions for:
determining if the image data group contains blank image data through
examination of the plurality of meta-data indicators; and
returning, in response to a determination of a blank image by the
instructions for determining, an encoded image data set representing a blank
image wherein the encoded image data set is generated by assembling a
combination of pre-stored compressed data output codewords.
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20. 31. The computer readable medium according to claim 25, wherein the
instructions for encoding include instructions for encoding by an LZW encoding
algorithm if the image data group is characterized as linework data.

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32. The computer readable medium according to claim 31, further comprising instructions for:

5 determining whether the image data group consists of two-tone image data and wherein the instructions for encoding, in response to a determination that the image data group consists of two-tone image data, produces an LZW formatted output by using arrays containing previously stored codewords corresponding to codewords representing runs of data values within the image data group that are equal to one of 0x00 and 0xff.

10 33. The computer readable medium according to claim 31, wherein the instructions for encoding further comprise instructions for:

15 analyzing a sequence of data within the image data group to identify a plurality of data patterns within the sequence of data;

20 15 outputting a codeword that represents each data pattern within the plurality of data patterns;

20 storing, in at least one separate data structure, a plurality of codewords wherein each codeword within the plurality of codewords is associated with a different data pattern within the plurality of data patterns, and wherein the data pattern that is associated with each codeword stored in the at least one separate data structure ends with a unique pre-defined data value; and

25 retrieving one of the plurality of codewords from the separate data structure upon a subsequent occurrence of a data pattern that ends with the pre-defined data value

34. The computer readable medium according to claim 33, wherein the unique pre-defined data value is equal to 0x00.

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35. The computer readable medium according to claim 25, wherein the instructions for identifying a plurality of image tiles further comprise instructions for:

5 accumulating a plurality of scan lines that are contained within the composite image data;

 analyzing a division buffer meta-data set, wherein the division buffer meta-data set comprises an accumulation of a mask data value and an accumulation of valid data value that are associated with each column of the plurality of scan lines;

10 determining a tile division definition, wherein the tile division definition identifies separate tiles within the plurality of scan lines by identifying at least one run within the accumulation of valid data values, wherein each of the at least one run contain a contiguous set of the accumulation of valid data values that have the same value.

15 36. The computer readable medium according to claim 35, wherein the instructions for accumulating comprise instructions for performing a pixel-by-pixel logical-OR for all pixels in corresponding columns within the plurality of scan lines.